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LIST OF STAPLE MEDICAL AND SURGICAL SUPPLIES

SELECTED TO MEET WAR CONDITIONS
BY THE COMMITTEE ON STANDARDIZATION
APPOINTED BY THE COUNCIL OF NATIONAL DEFENSE

PART IV

X-RAY APPARATUS AND SUPPLIES

COUNCIL OF NATIONAL DEFENSE
WASHINGTON, D. C.

▼

Adopted by
Section of Medical Industry
War Industries Board
September, 1918

WASHINGTON
GOVERNMENT PRINTING OFFICE
1918

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College of Physicians and Surgeons

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PREFACE.

TO THE end that the needs of the medical services of the Army and Navy, Red Cross, and Civilian Hospitals, in the matter of instruments, apparatus, and all supplies, may be successfully met under the abnormal conditions existing in time of war, the Secretary of War, as chairman of the Council of National Defense, appointed a Committee on Standardization to select a minimum number of articles essential to the conduct of the Nation's medical activities.

The lists of apparatus and supplies appearing in these pages were selected by subcommittees, appointed by the Committee on Standardization, composed of medical officers of the Army, Navy, Public Health Service, and Red Cross, and civilian workers of the highest type, working in conjunction with manufacturers of such apparatus and supplies.

In this selection of staple and essential articles the committee is assured of a maximum and economical production of such articles through the conservation of manufacturing resources and the simplification of manufacturing problems. It has been agreed by the manufacturers that the production of such articles as are listed shall be given precedence over other articles for similar purposes.

The committee has attempted to provide a list of those articles essential to the best X-ray work at base and general hospitals; and also a portable outfit for use at temporary hospitals.

Other lists published by the Committee on Standardization will include all classes of articles, apparatus, and equipment necessary to the conduct of the medical activities of the Nation. If there are omissions of essential articles from this list, or if errors have crept in, they will be corrected in a later edition.

SPECIFICATION FOR STATIONARY X-RAY MACHINE.

(INTERRUPTERLESS TYPE.)

Each machine to consist of the articles enumerated below.

Cabinet.—A cabinet made of high-grade hardwood free of knots or blemish; all glass parts of best French plate not less than three-sixteenths inch thick.

Transformer.—A high-tension transformer having a normal rating of at least 10 K. W., transformer winding to be so proportioned that it will deliver at its secondary terminals an alternating current of at least 100,000 volts potential in actual service. It must stand a continuous run of two hours at 60,000 volts, delivering 5 milliamperes to the tube and backing up a 6-inch spark, and be capable of delivering 50 milliamperes to the tube backing up a 6-inch spark.

Rectifier.—A rotary high-tension rectifying or commutating device accurately balanced, directly connected with the shaft of the rotary converter or synchronous motor set, adjusted to revolve near or in contact with suitable terminals by means of which the high-tension alternating current from the transformer is changed into a high-tension pulsating unidirectional one through the tube circuit, and in case a disk type of rectifying device is employed, the disk must be cut out between the conducting segments so as to provide an ample air gap, or the metal collecting segments must be set out from the edge of the disk.

Switchboard.—A substantial switchboard of good insulating materials, on which are securely mounted the necessary switches for properly operating the outfit; each outfit to be provided with a polarity indicator.

Motor.—A satisfactory synchronous motor, of suitable rating operating on an alternating current of the phase and potential noted in the circular of advertisement, same to be provided with all the necessary connections for proper operation.

Control.—A controlling rheostat for primary of the high-tension transformer, to be well ventilated, and so constructed and mounted as to permit of fine graduation of current flow and to operate continuously for fluoroscopy or treatment without overheating. In addition to the rheostat an autotransformer control will be furnished.

Milliammeter.—A milliammeter, reading accurately, and with an 8-inch double scale with shunt reading 0–10, and 0–100 ma., securely mounted on the machine and conveniently placed for observation.

Mountings.—Switchboard, transformer, motors, rheostats, time switch, connections, etc., to be mounted on the cabinet or detached. A separate rheostat for the primary will be allowed if satisfactory in appearance and size.

Terminals.—Each machine to be provided with substantial terminal posts mounted on the cabinet, and automatic conductor cord reel (8-foot cords) for connecting directly with an X-ray tube, to be attached to each post. The two main terminals to have an adjustable parallel spark gap of not less than 10 inches, the third terminal to be provided with a suitable device for regulating the vacuum of the tube. All spark gaps and regulating devices to be so constructed and designed that they can be conveniently and easily manipulated from the switchboard end of the machine.

Fluoroscopy.—Machine to deliver a satisfactory current for making continuous fluoroscopic observations.

Connections.—Such fuses and internal connections as may be required to operate the outfit; two 10-foot lengths of best quality No. 2 flexible conductor cord with suitable lugs, etc., on its ends, for connecting the machine with the terminals of the main feed wires.

Each machine to be complete with all necessary connections, to be practically noiseless in operation, and to run without noticeable vibration.

Each outfit to be well constructed mechanically in every detail: materials to be of best quality; workmanship and finish to be first class in every respect. Apparatus to be so constructed that it can be set up and all electrical connections made without the aid of an expert, and all parts of the outfit to be readily accessible for inspection.

All parts of the apparatus, mechanical and electrical, to be guaranteed for two and one-half years from the date of delivery, during which time breakdowns resulting from defects in the apparatus will be repaired by the contractor without expense to the purchaser.

The acceptance of each machine shall be contingent upon actual testing out of machine at place of delivery specified in contract of purchase.

1501. Ammeter, for Coolidge tube filament current, with scale reading from 3 to 5 amperes in divisions of twentieths.

1502. Apparatus, X-ray, interrupterless type, to operate on type of current available. (Information is necessary as to current type, whether alternating or direct, voltage, cycle, phase, two or three wire system.)

1503. Apron, lead, protective, with leather straps; 33 inches long, 24 inches wide.

1504. Apron, waterproof, 50 inches long.

1505. Box, lined with $\frac{1}{16}$-inch sheet lead, water-tight, to be connected with sewer; inside measurements 42 inches long, 22 inches wide, 19 inches deep, to hold tanks for developing, etc. To be constructed locally.

1506. Box, lined with $\frac{1}{8}$-inch sheet lead on all sides, 10 inches wide, 20 inches long, 18 inches deep, made of $\frac{3}{4}$-inch lumber, with hinged lid; for protection of plates from X-ray. To be constructed locally.

1507. Box, wooden, 12 inches long, 12 inches wide, 3 inches deep. To be constructed locally.

1507.1. Box for localization apparatus (1), to contain: Parallel wire device for Strohl method (1), method A (Strohl) celluloid strip with sliders (1), scale for Strohl localizer (1), Blaine parallax localizer (1), method B parallax strip rule (1), caliper for method C (1), celluloid strip for method C (1), localizer scale for cross-thread method (1), profundometer localizer. (1), Hirtz compass (1), fluoroscopic adapter for Hirtz compass (1), Sutton localizer set (1).

1507.2. Bonnet fluoroscope (purchase in France).

1507.3. ? Breaker circuit, 220-volt, 100-ampere maximum.

1508. Brush, camel's hair, 3-inch.

1509. Carriers, plate, core, 10 x 12 inches, Monel metal.

1510. Carriers, plate, core, 14 x 17 inches, Monel metal.

1510.1. Carrier, film (Case), Eastman, for development, 8 x 10 inches; carriers, film (Case), Eastman, for development, 10 x 12 inches; carriers, film (Case), Eastman, for development, 14 x 17 inches.

1510.2. Chart, eye localizing, Kelley-Koett.

CHEMICALS FOR X-RAY LABORATORY.

1510.3. Barium sulphate, for X-ray diagnosis, in 1-pound tins.
Chrome alum, in 1-pound bottles.
Developing powder, Eastman's, each package to make 1 gallon.
Formaldehyde, in 1-pound bottles.
Hydroquinone, in $\frac{1}{4}$-pound bottles.
Metol, or equivalent, in 1-ounce bottles.
Potassium bromide, in 1-pound wide-mouthed bottles.
Sodium carbonate, in 1-pound and 5-pound bottles.
Sodium hyposulphate, in 1-pound tins, 5-pound wide-mouth bottles, and 100-pound kegs.
Sodium sulphite, dry, in 1-pound and 5-pound bottles.

1511. Crocks, earthenware, 5-gallon.

1512. Dental film holders, Eastman or equivalent, for development.

1512.1. Film holders (Case type), Eastman, 10 x 12 inches, to accommodate 10 x 12 and 8 x 10 films between two screens.
1512.2. Film holders, Eastman, for exposure, 8 x 10 inches.
1512.3. Film holders, Eastman, for exposure, 10 x 12 inches.
1512.4. Film holders, Eastman, for exposure, 14 x 8½ inches.
1512.5. Film holders, Eastman, for exposure, 14 x 17 inches.
1513. Films, dental, positive, 1½ x 2½ inches, No. 1A.
1514. Films, dental, positive, 1¼ x 1⅝ inches, No. 1.
1514.1. Films, X-ray, 8 x 10 inches.
1514.2. Films, X-ray, 10 x 12 inches.
1514.3. Films, X-ray, 14 x 8½ inches.
1514.4. Films, X-ray, 14 x 17 inches.
1515. Funnels, enamel ware, 6-inch.
1515.1. Glass cutter.
1516. Glass, lead, $\frac{3}{16}$-inch thick, 8 x 10 inches.
1516.1. Glass, lead, 10 x 10 inches, perforated in center.
1517. Gloves, opaque, protective gauntlet.
1518. Goggles, automobile type, fitted with red and green superimposed clear polished celluloid, Arlington Pyralin, colors 24 and 181, 0.01 inch thick, finish HH.
1519. Insulators, wall, for high-tension wires, laminated paraffined paper, 18 x 3 inches, with $\frac{1}{2}$-inch aperture.
1519.1. Insulators, four-arm, for high-tension wires.
1520. Lead foil, medium thickness.
1521. Light, incandescent, blue, with pull switches, for fluoroscopic room. 16 c. p.
1522. Lead, in sheets, 4 pounds to square foot.
1523. Localizer, eye, Kelley-Koett or equivalent.
1524. Numbers, lead, ½-inch, 1 to 0.
1524.1. Marker, skin.
1525. Pitchers, enamel ware, 2-quart.
1526. Preservers, negative, for 14 x 17 inch plates.
1527. Preservers, negative, for 10 x 12 inch plates.
1528. Preservers, negative, for 8 x 10 inch plates.
1528.1. Preservers, negative, for 5 x 7 inch plates.
1528.2. Paper, tracing, 14 x 17 inches.
1528.3. Paper, tracing, 10 x 12 inches.
1528.4. Plate rack, folding, for 25 plates.
1528.5. Pencils, grease, Blaisdell, red and blue.
1529. Plate changer, stereoscopic, for 14 x 17 plates, Kelley-Koett or equivalent.
1530. Plates, X-ray, 14 x 17 inches.
1531. Plates, X-ray, 10 x 12 inches.

1532. Plates, X-ray, 8 x 10 inches.
1532.1. Plates, X-ray, 5 x 7 inches.
1533. Rack, tube, wooden, 5-inch holes, to be constructed locally.
1534. Radiometer, Hampson's or equivalent.
1535. Reels, trolley.
1536. Reels, double Coolidge.
1537. Roentgenoscope, vertical, arranged for Coolidge tube box protected by sheet lead $\frac{1}{8}$ inch thick on front and sides, furnished with good grade fluoroscopic screen, 11 x 14 inches, mounted in screen holder with protected handles and covered with lead glass at least $\frac{3}{16}$ inch thick and equivalent in opacity to 33 per cent lead.
1538. Rotary converter, of 7½ kw. capacity, complete with starting box and switches, capable of continuous operation at 7½ kw., and of sustaining an overload of 150 per cent for 10 seconds, to deliver a satisfactory alternating current to the X-ray machine from a direct current source.
1538.1. Ruler, wood (15 inches), with metric system.
1539. Safe light, dark room, Eastman Brownie or equivalent.
1539.1. Safe light, dark room, Wratten.
1540. Sandbags, 3 x 4 x 8 inches, empty, open one end.
1540.1. Sandbags, 3 x 4 x 18 inches, empty, open one end.
1540.2. Sandbags, 5 x 4 x 6 inches, empty, open one end.
1541. Screens, intensifying, mounted in cassettes, detachable, size 14 x 17.
1541.1. Screens, intensifying, mounted in cassettes, detachable, size 10 x 12.
1541.2. Screens, intensifying, mounted in cassettes, detachable, size 8 x 10.
1542. Screens, intensifying, without cassettes, furnished in cardboard folder, size 14 x 17.
1542.1. Screens, intensifying, without cassettes, furnished in cardboard folder, size 10 x 12.
1542.2. Screens, intensifying, without cassettes, furnished in cardboard folder, size 8 x 10.
1543. Stand, tube, Kelley-Koett type, or equivalent, so constructed and counterbalanced that the tube carriage will move smoothly and easily, and remain in any position without adjustment of screws or other contrivances; must be of strong and rigid construction so that there shall be no noticeable vibration when in use, nor perceptible movement of the tube carriage when being used for compression of the abdomen while the patient breathes; must allow for shifting the tube

both laterally and in the direction of the length of the table, and for tilting it for stereoscopic work. Stand must be provided with a lead glass bowl equal in opacity to $\frac{1}{16}$-inch of lead. Base must be of a size and weight to render stand secure against overturning, and provided with large easily acting and tracking casters with at least ½-inch trails; highest part of base must not exceed 6 inches from floor. Stand must be provided with slot for diaphragms and filters, and with two cones, 5 and 7 inches in diameter, and a set of aluminum filters of 1, 2, 3, and 4 millimeters in thickness.

1544. Stand, wall, for Coolidge tube transformer and ammeter.

1545. Stand, wooden, to support 11 x 14 inch fluoroscope above patient; adjustable legs.

1546. Stereoscope, Wheatstone, furnished with 100-watt nitrogen lamps and regulated by dimmers, permitting of gradual regulation; or provided with separate switches for each pair of lamps.

1547. Switch, foot, attachable to three buttons on rheostat, complete with connecting cables.

1547.1. Switch, foot (Kelley-Koett, pl. 51, Cat. No. 24, or equivalent).

1548. Switch, foot, single, complete with connecting cable.

1549. Switch, high tension, double throw, Coolidge equipped.

1550. Switch, high tension, single throw, Coolidge equipped.

1551. Table, United States Army base hospital and portable type, according to the following specifications:

Table, X-ray, for portable apparatus, consisting of pair of cast aluminum end frames, slotted to receive three tubing members each 6 feet long, each end of these three members (which are interchangeable) to be provided with a screw and handle which locks them rigidly in place in the slots, providing a light strong and rigid frame upon which the regulation litter or a special top may be laid. The top of the table will have the following specifications:

Dimensions.—Length over all, 83 inches; width over all, 26 inches; rails, 2 x 2 inches.

Material.—Rails and handles of straight grained sound wood, free from knots. Handles, straight-grained rods of suitable size. Tops of "Continental Bakelite," approximately $\frac{1}{10}$ inch thick and of dimensions as ordered by the builder.

Finish.—Woodwork to be finished in as nearly waterproof manner as possible. No finish on Bakelite.

Construction.—Rectangular frame 6 feet 4 inches x 26 inches outside; well constructed. Each side rail to have a groove as shown by sample submitted. Rail slit to take Bakelite top with glue and dowel pin, as shown in model and sample submitted. Top to be as tense as material will permit.

Rail frame to allow shift of patient: Rectangular frame of straight-grained 2 x 2 inch wood. One side rail with raised ridge to take groove of top. Crosspieces to be attached under side rails with screws and angle iron. To allow these pieces to fit between metal frames of standard table 6 feet 2 inches inside, side rails to be 6 feet 8 inches long.

A roller-supported carriage is constructed to travel on tops of the upper side members and fitted with roller bearings. This carriage consists of two side members of square cross section and two transverse members of round cross section. Traveling on the round cross members and underslung therefrom is a tube box supported by spool rollers with roller bearings, box to be covered with lead having weight of 4 pounds to square foot. The opening in the middle of the top of the box will be provided with diaphragms, the shutters of which may be moved independently and give a diamond-shaped opening or slit parallel to long axis of the table at will. The box must be so constructed as to carry conveniently and safely the special type of Coolidge tube described below, and provide for free access of air to the radiator. Stops should be provided on the tube-box carrier which, with sliding rings provided with milled head screws, will permit of a tube shift of (*a*) 10 c.m., (*b*) 15 c.m., (*c*) any desired shift to be measured by calipers. The tube mounting must be provided to pass through the end of the box and with attachments for Coolidge filament and operating wires from the reels. A simple catch is provided to fasten the tube carrier in place. The radiator must be protected from injury by covering the ventilating openings with wire netting. Convenient brakes are to be provided to fix the tube carriage in its longitudinal and lateral runs. A string-operated switch, 10 ampere, 250 volts, is to be provided, having special clamp to attach same to table and with eyelets on the carriage to keep string in place. The switch must open or close two circuits simultaneously. Flexible 4-wire cable is attached to this switch, having at the other end plug connections fitting sockets in the instrument box.

1552. Tank, porcelain, 4½ x 14¾ x 20 inches, for developing.

1553. Tank, porcelain, 14¾ x 14¾ x 20 inches, for washing and fixing.

1554. Thermometer, bath.

1554.1. Time switch, Wappler or equivalent.

1555. Tools, set, consisting of hammer, saw, case opener, large and small screw driver, heavy cutting pliers.

1556. Trays, enamel ware, 14 x 17 inches.

1557. Trays, enamel ware, 10 x 12 inches.

1558. Transformer, Coolidge filament lighting, insulated against breakdown test of 50,000 volts. Primary current-control device of either resistance or inductance type.

1559. Tubes, Coolidge, fine or medium focus.

1559.1. Tubes, Coolidge, special radiator type (Current limit, 10 milliamperes, at 50,000 volts).

1560. Tubes, 7-inch, tungsten target.

1561. Tunnels, plate changing, aluminum, 8 x 10 inches, Kelley-Koett or equivalent.

1562. Tunnels, plate changing, aluminum, 10 x 12 inches, Kelley-Koett or equivalent.

1563. Tunnels, plate changing, aluminum, 14 x 17 inches, Kelley-Koett or equivalent.

1563.1. Tunnels, plate changing, aluminum, 17 x 17 inches, with one plate drawer, Kelley-Koett or equivalent.

1563.2. Turnbuckles, 6-inch, for trolley.

1564. Wedge, wooden, 12 x 12 x 3 inches, angle 27 degrees.

1564.1. Wedge, wooden, 12 x 3 inches, angle 23 degrees.

1565. Wire, bronze, for overhead systems, No. 10.

1565.1. Wire, copper, spool of 12 yards in length, No. 16 gauge.

1565.2. Wire, annunciator.

SPECIFICATIONS, UNITED STATES ARMY BEDSIDE X-RAY UNIT.

1575. Cabinet and tube holder; to be made of best quality polished quartered oak. Door to have piano hinges full length. Base of cabinet 24½ x 15 x 1⅜, cabinet 15 inches wide, 19 inches long, and 36 inches high, ¾-inch stock. Polished on all sides. Cabinet to be mounted on rubber-tire wheels 4 inches in diameter. Mounted on the base a nickel-plated tube stand with a ball-bearing arm, ball-bearing head at top, a tube holder made of wood to support the lead glass holder at each end, and arranged so that the tube can be put into any position. The whole arrangement counterbalanced. The nickel-plated stand to be of 2½-inch tubing, 5 feet over all. Lead glass shields are to be used in connection with the special radiator type of Coolidge X-ray tube, the opening of 2 inches in diameter to be covered with one millimeter of aluminum, properly mounted on the shield. This lead glass shield to entirely inclose the X-ray tube, except at the end and the 2-inch opening. This shield to be made of lead glass equivalent to $\frac{1}{16}$ inch of metallic lead, must be of uniform wall thickness and pressed instead of blown.

1576. High tension transformer; to be of such a size that it will fit in the upper portion of the cabinet and is to be mounted in a steel tank with an oil-tight top. To be of the closed core type and to have the filament current transformer inside of the same tank. Transformer tank to be mounted on a well-braced shelf, rigidly fastened for trans-Atlantic shipment and leaving sufficient space below shelf for apparatus hereinafter mentioned. Transformers to be designed so that they will deliver a current of 5 milliamperes at a 5-inch useful voltage to the Coolidge tube, and under these conditions operating on the 110-volt, 60-cycle current; the total primary current is not to exceed 5 amperes. Transformers to be designed so that they will operate on any frequency from 25 to 133, without any change in controls or wiring systems. The primary of the transformer to be arranged so that it can be used with a 110-volt direct-current rotary, a 110-volt alternating current, or a 220-volt direct-current rotary, so that in order to change from alternating current to direct current it is simply necessary to throw the switch to the proper side. These positions to be plainly marked with the words "alternating" on one side and "direct" on the other.

1577. *Cable.*—An 8-foot cable to be supplied to connect with the electric service. A 10-foot cable with a foot switch is to be supplied, so arranged that both the filament current and the high-tension current come on at the same instant.

1578. *Milliampere meter.*—A milliampere meter is to be mounted in the top of the cabinet to measure tube current, reading from 0 to 10 milliamperes. This milliampere meter is to be connected in series in the middle of the secondary and to be grounded to the case.

1579. *Reels.*—There is to be a single reel to connect with the positive end of the Coolidge tube, and a 2-wire cable with a lamp socket, to connect with the negative end of the Coolidge tube. All binding posts, taps, or other electrical connectins are to be plainly labeled in such a manner as to avoid danger of removal or erasure.

1580. *Wiring diagram.*—A complete wiring diagram is to be attached to the inside door of the cabinet, protected by a thin sheet of transparent celluloid and explicit statements of the changes needed in connections when using other than the currents herein specified shall be given thereon.

1581. Rotary converter that will start on 110 volt without requiring a starting resistance. Must operate unit as on 110 volt A. C.

1581.1. Rotary convertor, with resistance, for use on 220-volt line.

1582. Fluoroscope, 11 by 14, special folding, with demountable stand and detachable plate holding device as furnished by Waite & Bartlett.

1583. Auto transformer, 1½-kilowatt, 110 to 220.

1584. Ten ampere screw fuse plugs.

1585. Extra set of brushes for rotary converter.
1586. Ten-ohm resistance for 220-volt rotary.
1587. Extra-lead glass shield.
1588. Foot switch.

PORTABLE APPARATUS AND EQUIPMENT.

1601. Booster, for portable apparatus, to take care of drop in voltage in filament circuit when full load is thrown on the gas-electric set, shall be of such design that with its primary in series with the supply voltage and its secondary in series with the primary of the filament transformer, it will compensate for the drop in voltage to such an extent that the filament current will not vary over 0.2 amperes from its original setting. Furnished with switch by which booster can be short circuited.

1602. Dark room, for portable apparatus. Specifications on application.

1603. Fluoroscope, for portable apparatus; dimensions 10 x 10 inches. The carrier to have the following features:

1. It must run easily on suitable bearings on two side rails of the table.
2. It must be readily locked in any desired position independent of tube box.
3. Provision should also be made to lock the carrier to the tube box.
4. The arm carrying the screen should be capable of rotation about a vertical axis.
5. A metal frame holding the screen should be fastened to this arm at one corner of the frame so as to allow rotation of the screen about a vertical axis passing through the corner.
6. The screen with its frame and lead glass should be easily removable from the holder to permit its use separately when desired.
7. The screen will be pierced in its exact center by circular hole, 3 mm. in diameter and lined with aluminum.

1603.1. Fluoroscope, 11 x 14 inches, special folding, with demountable stand and detachable plate holding device as furnished by Waite & Bartlett.

1604. Gasoline electric set (Delco), for portable apparatus, consisting of a one-cylinder gasoline engine with a built-in generator, with the following modifications: (1) Special armature winding with slip rings so that both alternating and direct current are available, direct current being used for field excitation; (2) special ignition system, rendering use of storage batteries unnecessary; (3) special voltage control by which a solenoid fed by direct current supply controls the carburetor; (4) suitable resistance across a. c. and d. c. terminals to protect from surges. Capacity 750 watts. Each machine to be packed in a permanent shipping and carrying case, and to be furnished with one set of extra brushes and fuses.

1605. Milliammeter, scale 0–15.

1606. Packing box for portable dark room, chemicals, etc., to be 44¼ inches long, 37¼ inches wide, and 32¾ inches deep, with two compartments in the bottom, 6½ inches deep and covered by hinged lids, one compartment to be lined with lead $\frac{1}{16}$ inch thick.

1607. Rheostat for filament control, for portable apparatus, inductive type capable of giving a variation over a range from 4 to 5 amperes in the filament circuit.

1608. Rheostat for solenoid control of engine speed, to have a resistance of approximately 2,000 ohms and be capable of carrying continuously not less than 0.25 amperes, to be substantially constructed, the wires shellacked or enameled in position and with metal bands clamping the windings at end of cylinder.

1609. Transformer, for portable apparatus, closed core type, both terminals developed, oil insulation, provided with an oil-tight top. When excited by the gas-electric set described above and using only one-half of the sine wave, it shall be capable of delivering to the X-ray tube 10 milliamperes, with a useful voltage corresponding to a back-up spark of 5 inches between points; this useful voltage to be determined by connecting a Kenotron in series with the X-ray tube and measuring the potential drop across the tube by means of a point gap in parallel with the tube. The higher inverse voltage resulting from the use of only one-half of the wave shall be measured by means of a point gap in parallel with both the X-ray tube and Kenotron and shall not exceed useful voltage by 3 inches.

1610. Transformer, Coolidge filament-lighting, oil insulated with an oil-tight cover, primary and secondary windings to be insulated from each other for a voltage not less than that corresponding to a back-up spark of 8 inches measured between points. With double cord reel for connecting the cathode of the X-ray tube and the transformer; Victor Electric Corporation's standard transformer for 110 volts, 60 cycle, or equivalent.

1611. Trochoscope and table, see 1551 specifications.

1612. Tube, special Coolidge air-cooled type, for portable apparatus, with radiator type of anode. Tube 3¾ inches in diameter, tungsten target backed with copper connected to heavy copper rod extending outside tube and terminating in air-cooled radiator, capable of rectifying its own current. (Current limit, 10 milliamperes at 50,000 volts.) A shipping and carrying case is to be provided by the company furnishing tube, to be of the general design of that employed by the General Electric Co. (bird-cage type).

1613. Voltmeter, alternating current, scale 0–175.

1614. Instrument box of substantial construction is to be provided in which are permanently placed the following: X-ray transformer; Coolidge filament transformer; filament control; milliammeter, 0–15 milliamperes (Weston miniature preferred); voltmeter as specified; rheostat as specified; wiring diagram; operating switch. General design as set up by the Victor Electric Corporation. To be furnished with approved insulators removable for shipment, well constructed reels, good chest handles or equivalent, split plug connectors and connecting cable 50 feet long (Victor Electric Corporation).

1615. Box, for localizing apparatus as No. 1507.1.

1616. Lamps, electric, orange-ruby, 110 volts, 25 watt.

1617. Graduates, 250 c. c.

1618. Nut wrench "Carl," 6-inch, thin jaw, Kelley-Koett.

1619. Rack, plate-drying, folding for 1 dozen plates.

1620. Cable, multiple, 50 feet long, inclosed in flexible waterproof cover, provided with circular brass connection plugs of various sizes at terminals substantially made. (Where this cable is constructed by drawing the necessary wires through rubber hose, care must be taken to securely seal point of exit of wire from hose to prevent entrance of moisture.)

X-RAY SUPPLIES.

AVAILABLE UPON REQUISITION.

Aprons, lead-protective (number).
Aprons, water-proof, 50 inches long (number).
Barium sulphate (pounds).
Booster, for portable apparatus (number).
Bowl, glass, lead, for K–K tube stand (number).
Box, for localizing apparatus, complete with contents (number).
Brushes, for rotary converter, bedside, D. C. and A. C. (sets).
Bulbs, electric, orange ruby, 110-volt, 25-watt (number).
Cabinet and tube holder, bedside unit (number).

Cable, cathode, with lamp socket, for bedside unit (number).
Cable, 8-foot, for bedside unit (number).
Carriers, plate, core, for tank development:
  10 x 12 inches (number).
  14 x 17 inches (number).
Carriers, film, for tank development:
  8 x 10 inches (number).
  10 x 12 inches (number).
  14 x 17 inches (number).
Cassettes:
  8 x 10 inches (number).
  10 x 12 inches (number).
  14 x 17 inches (number).
Charts, localizing, Kelley-Koett (number).
Chrome alum (pounds).
Developing powders, Eastman:
  Each package to make 1 gallon (packages).
  Each package to make 1 quart (packages).
Films, dental:
  No. 1, 6 dozen in box (boxes).
  No. 1A, 6 dozen in box (boxes).
  Holder for, developing (number).
Films, holders (Case type), Eastman, to accommodate films between two screens:
  8 x 10 inches (number).
  10 x 12 inches (number).
  14 x 17 inches (number).
Films, X-ray:
  14 x 17 inches (dozen).
  10 x 12 inches (dozen).
  8½ x 14 inches (dozen).
  8 x 10 inches (dozen).
  5 x 7 inches (dozen).
Fluoroscope, special folding, W. & B. (number).
Fuse, screw plugs, 10-ampere (number).
Glasscutters (number).
Glass, ground, for stereoscopes already furnished (give exact size) (number).
Glass, lead, $\frac{3}{16}$ inch thick:
  11 x 14 inches (pieces).
  8 x 10 inches (pieces).
Glass, pierced in center, 10 x 10 inches (pieces).
Gloves, opaque, protective gauntlet (pairs).
Goggles, automoble type (number).

Graduates, glass, heavy, straight, 250 cc. (number).
Hydroquinone, ¼-pound bottles (bottles).
Lamps, tungsten, nitrogen, 100-watt (number).
Lead foil (pounds).
Light, incandescent, blue, with pull switches, 16-candlepower (number).
Localizer, eye, Kelley-Koett (number).
Marker, skin (number).
Metol, or equivalent, 1-ounce in bottle (bottle).
Milliampere meter, 0–100 (two scales) (number).
Milliampere meter, for bedside unit (number).
Oil, transformer, 5-gallon cans, boxed (number).
Paper:
  Bromide (glossy), 5 x 7 inches (dozen).
  Print, glossy, Velox (hard)—
    8 x 10 inches (dozen).
    10 x 12 inches (dozen).
  Tracing—
    14 x 17 inches (sheet).
    10 x 12 inches (sheet).
Pencils, grease, Blaisdell:
  Red (number).
  Blue (number).
Plates, X-ray:
  14 x 17 inches (dozen).
  10 x 12 inches (dozen).
  8½ x 14 inches (dozen).
  8 x 10 inches (dozen).
  5 x 7 inches (dozen).
Plate rack, folding (number).
Portable instrument boxes, complete (number).
Potassium bromide (pounds).
Pitchers, enamel ware, 2-quart (number).
Reels, single, for bedside (number).
Reels:
  Trolley, plain (number).
  Double, Coolidge, for roentgenoscope (number).
Resistance, 10-ohm, for 220-volt rotary (number).
Rotary converter, bedside:
  220 volts (number).
  110 volts (number).
Ruler, wood, metric system.
Safe light, dark room, Wratten or kodak (number).
Sandbags. 3 x 4 x 18 inches (number).

Screens, intensifying, without cassettes, in cardboard folder:
- 14 x 17 inches (number).
- 10 x 12 inches (number).
- 8 x 10 inches (number).
- 5 x 7 inches (number).

Screens, fluoroscopic, for portable, 10 x 10 inches (number).
Shields, separable, lead glass, for tube, on bedside unit (number).
Sodium carbonate, dry (pounds).
Sodium hyposulphite (pounds).
Sodium sulphite, dry (pounds).
Switch, foot, W. & B. (number).
Tank, porcelain:
- 4½ x 14¾ x 20 inches (number).
- 14¾ x 14¾ x 20 inches (number).

Thermometer, bath (number).
Transformer:
- Coolidge tube filament (number).
- Coolidge filament, Victor (number).
- High tension, bedside unit (number).
- High tension, portable Victor (number).

Trays, enamel ware:
- 14 x 17 inches (number).
- 10 x 12 inches (number).

Tubes, Coolidge:
- Medium focus, standard (number).
- Radiator type, fine focus (number).
- Radiator type, medium focus (number).

Tubes, 7-inch tungsten target (number).
Voltmeter, alternating current, 0–175 volts, Victor (number).
Plates, photographic, panchromatic, 5 x 7 (dozen).
Plates, lantern slides, 3¼ x 4 (dozen).
Tape, binding, for lantern slides (rolls).
Cover glasses for lantern slides (dozen).

SPARE PARTS FOR THREE-FOURTH KW. DELCO AND PORTABLE OUTFIT.

Armature, for generator, complete with commutator and slip rings (number).
Box, breaker complete (number).
Brushes, for generator, direct current (sets).
Brushes for generator, alternating current (sets).
Cables, 50-foot, for generator (number).
Coils, ignition (number).
Cylinder, Delco (number).
Delco engine generating set (number).
Filament control, for portable, Victor (number).

Oil (gas engine cylinder), 5-gallon cans (cans).
Plugs, spark (number).
Rheostat, for solenoid control, portable (number).
Rings, piston (number).
Solenoid, for throttle control, Delco (number).
Springs, for brush holder, Delco (sets).
Valves, with springs, complete:
    Inlet (number).
    Exhaust (number).

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